

XV. STUDIES ON INFUSORIA.

By EKENDRANATH GHOSH, *M.Sc., M.D.*

I. ON A NEW SPECIES OF *Anoplophrya*. STEIN, *emend.* CÉPÈDE.

The genus *Anoplophrya*, Stein, as restricted by Cépède (2) may be diagnosed as follows:—Infusoria with flattened ribbon-shaped body (cylindrical in one species) entirely and uniformly covered with cilia arranged on longitudinal striae close to one another (rarely distant); no cytostome; with well defined macro- and micro-nuclei; c. v. in single or double longitudinal rows, or rarely scattered, or very rarely absent. Division by transverse fission, sometimes with formation of chains (*i.e.*, with satellites) due to incomplete and retarded separation of the daughter individuals. Endoparasites of various annelids.

Anoplophrya lloydii, sp. nov.

The species may be diagnosed thus: Elongately oval with subtruncate posterior end; curved longitudinally with the dorsal side convex and the ventral concave; macronucleus irregularly ribbon-shaped, extending to nearly the whole length of the animal; micronucleus small,

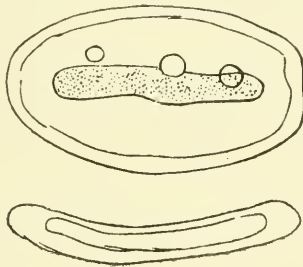


FIG. 1.—*Anoplophrya lloydii*, sp. nov.

spherical, placed at the side of the macronucleus; c. v. 3, on the right side. In seminal vesicles of an earthworm (*Pheretima posthuma*). Unfortunately the measurements are not noted.

The species comes nearest to *A. striata* in many respects.

Up to the year 1915, the number of well recognised species of *Anoplophrya* was 16, making a total of 17 with the present one.

These species of *Anoplophrya* may be tabulated in the following synopsis:—

a. No C. V.

- a¹. Body elongately oval, pointed anteriorly, truncate (when with satellites) or tapering and pointed posteriorly; macronucleus ribbon-shaped, with a knobbed end.

1. *A. mayyasi*, Cépède (2), p. 411.

- b¹ Body ovoid or uniform; rounded anteriorly, swollen and acuminate posteriorly; only 4 or 5 longitudinal ciliary striae; macronucleus spherical or ovoid, in posterior body half.

2. *A. minima*, Leger and Duboscq (3);
Cépède (2).

- b. With C. V.
- a¹. C. V. in a single row.
- a². Body oval.
- a³. Body straight dorso-ventrally.
- a⁴. Body elongately oval, length = 3 to 5 times the breadth; sometimes obliquely truncate posteriorly. C. V. 9-10 or more; macronucleus elongated and axial.
3. *A. naidos*, Stein (*A. inermis*, Kent.)
- b⁴. Body elongately oval with rounded ends; length equal to or less than twice the breadth; C. V. large, 3-5 in number; macronucleus elongately oval.
4. *A. ovata*, Clap.
- b³. Body curved dorso-ventrally in a longitudinal direction, oval with rounded ends; C. V. 4-6 in number; long ribbon-shaped macronucleus with rounded ends.
5. *A. convexa*, Clap.
- b². Body not oval in shape.
- a³. Body bilobed with a constricted portion in the middle; anterior lobe swollen and oval; posterior lobe less so and pointed behind; C. V. 4-7 in number; macronucleus oval and placed at the anterior end.
6. *A. cecleariformis*, Leidy.
- b³. Body not bilobed.
- a⁴. Body elongately club-shaped; dilated anteriorly and obliquely truncate; posterior end attenuate, rounded or acuminate; C. V. 6 or 7; longitudinal striae few in number with distinct intervals.
7. *A. clavata*, Leidy.
- b⁴. Body elongated and vermiform.
- a⁵. Body cylindrical, little or not flattened, rounded anteriorly and acutely pointed posteriorly; cilia long; C. V. 7; macronucleus with club-shaped anterior end.
8. *A. paranoides*, Pierantoni (5).
- b⁵. Body flattened; macronucleus ribbon-shaped; C. V. numerous (about 30 in number).
- a⁵. Animal free-swimming with ordinary movement, micronucleus spherical and granular.
9. *A. filum*, Clap.*
- b⁵. Animal moving by vermicular contractions of the body; micronucleus inconspicuous.
10. *A. vermicularis*, Leidy.*
- b¹. C. V. in 2 rows.
- a². Body oval in shape.
- a³. Body oval, more pointed anteriorly than posteriorly, sometimes both ends rounded; macronucleus with lateral expansions (not distinctly branched) and with a distinct nucleus membrane; micronucleus fusiform and placed obliquely in the outermost layer of endoplasm at a distance from the macronucleus.
11. *A. alluri*, Cépède.
- b³. Body elongately oval, widest anteriorly, often with a number of satellites (*A. prolifera*), macronucleus axial, band-like; micronucleus fusiform in posterior body half.
12. *A. nodulata*, Müller.
(*A. brasili*, Leg. and Duboscq).
- c³. Body triangular, narrow and rounded anteriorly, truncate posteriorly.
13. *A. pachydrili*, Clap.
- c¹. C. V. scattered irregularly.
- a². Body curved dorso-ventrally in a longitudinal direction.

* The species *A. filum* and *A. vermicularis* are considered identical by Schewiakoff (6), but are taken to be distinct and separate by Cépède (2).

a³. Body elongately oval; length equal to or less than twice the breadth; longitudinal ciliary striae at distant intervals; macronucleus with lateral expansions and approaching the concave face; fusiform micronucleus placed obliquely near the left border.

14. *A. striata*, Duj.

b³. Body elongately oval with subtruncate posterior end; longitudinal striae close; macronucleus irregularly ribbon-shaped; micronucleus spherical and placed at the side of the macronucleus; C. V. 3, on the right side.

15. *A. Lloydii*, n. sp.

b². Body straight in profile.

a³. Body oval in shape; C. V. 10 in number.

16. *A. acgitensis*, Cépède (2), p. 543.

b³. Body irregularly oval, tapering and rounded anteriorly, wide and truncate posteriorly; C. V. 2, on one side, one in the middle and one near the posterior end; macronucleus irregularly oval, placed transversely; longitudinal striae close.

17. *A. simplex*, Andre (1).

Insufficiently described species:—

1. *A. socialis*, Leidy. Oval, cordiform, fusiform or globular in shape; C. V. numerous.

2. *A. notci*, Foulke, 1885 (*Amer. J. Sci.*, XXIII, pp. 377-378), resembling *A. socialis*, but without ciliary striae, cilia long and much thickened.

LITERATURE.

1. ANDRE.—*Rev. Suisse. Zool.*, Vol. XXIII (1915), p. 102.
2. CÉPÈDE.—*Arch. Zool. Paris*, sér. 5, Vol. III, pp. 341-609, 1910.
3. LÉGER AND DUBOSCQ.—*C. R. Acad. Sci.*, Vol. CXLVIII, p. 365.
4. KENT.—*A Manual of Infusoria*, 1880-1882.
5. PIERANTONI.—*Arch. Protist.*, Vol. XVI, 1909, pp. 81-106.
6. SCHEWIAKOFF.—*Mem. Ac. St. Petersbg.*, Vol. VII (i), pp. 379-382.

II. TWO NEW SPECIES OF *Conchophthirus*, STEIN.

The genus *Conchophthirus*, Stein, may be diagnosed by the following characters: Body colourless and non-contractile, strongly compressed, generally oval in shape (sometimes elongated), with ventral surface usually more convex than the dorsal and somewhat notched in the ventral region; right side (back) more arched than the left; peristome a cup-shaped, funnel-shaped or short tubular cavity, sometimes prolonged into a long, recurved, tubular cytopharynx (non-ciliate); ciliary striae distinct; cilia uniform, moderately long and mostly tufted, sometimes a strong adoral zone in the anterior peristomial margin. C. V. mostly one, subcentral or postero-terminal, macronucleus spherical oval, or irregularly triangular, one, rarely seven in number, subcentral or terminal. Anus terminal. Ectoparasites in mantle chamber of various molluscs.

The genus included 3 species in Kent's *Manual of Infusoria* (1880-1882), viz.:—*C. anodontae*, *C. steenstrupi* and *C. curtes*. *Plagiotoma acuminata* Clap. and Lach. seems to be identical with *C. anodontae*.

Bütschli (2) in *Protozoa*, Bronn's *Thierreich* (p. 1720) included three more species: *C. actinarium* [*Plagiotoma actinarium* Clap. (5)], *C. magna* [*Tillina magna*, Gruber (7)] and *Plagiopylla nasuta* var. *marina* Gourret and Roeser (6). The first species is now made the type of a new genus *Foettingeria* by Caullery and Mesnil (3) and is also noted by Andre (1).

The second one is not recognised by Schuberg (10) as a species of *Conchophthirus* the cytopharynx of *Tillina* being ciliated. The third species also cannot be considered to belong to the present genus.

Schuberg also refused to admit *C. curtes* as a distinct and separate species from *C. anodontae* as they were found in the same host; he considered the former as a variety of *C. anodontae*. But as *C. curtes* has only been found in *Lamellidens marginalis* with two new species of *Conchophthirus* (to be presently described), it cannot be considered to be the same species as *C. anodontae*.

Lastly three other species have been described by Certes (4), Andre (1) and Mermod (9), raising the number to 6 in all.

The two new species of *Conchophthirus* have been found in the mantle chamber of *Lamellidens marginalis* with *C. curtes* in the same specimens, the latter being exceedingly rare in occurrence.

***Conchophthirus elongatus*, sp. nov.**

Body elongated, about $2\frac{1}{2}$ times as long as broad, wide anteriorly, anterior end rounded and sloping to the back (left side); rather abruptly tapering and bluntly pointed at the posterior end; right side nearly straight, slightly convex in front and behind, and faintly

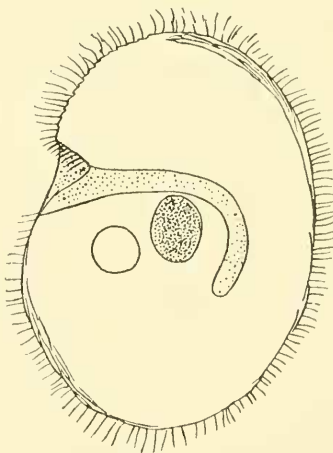


FIG. 2.—*Conchophthirus elongatus*, sp. nov.

concave in the middle; left side with a shallow notch just behind the anterior one-third of the body-length, where the peristome is situated; peristome small, elongately conical, directed forwards and to the right; longitudinal ciliary striae very marked at the anterior end, less so on the remainder of the body. Macronucleus oval, posterior and subterminal. C. V. single at the junction of the middle and posterior one-third of the body-length, sometimes slightly displaced. Length 0.05 mm.

***Conchophthirus lamellidens*, sp. nov.**

Body ovate, about $1\frac{1}{2}$ times as long as broad, bluntly pointed at both ends; right side strongly convex, left side convex and minutely

dentate in the anterior and slightly notched in the posterior half. Peristome in the anterior portion of the notch, short and tubular, being directed forwards, and to the left. Generally a dark granular zone in the anterior one-third of the endoplasm. Longitudinal striae

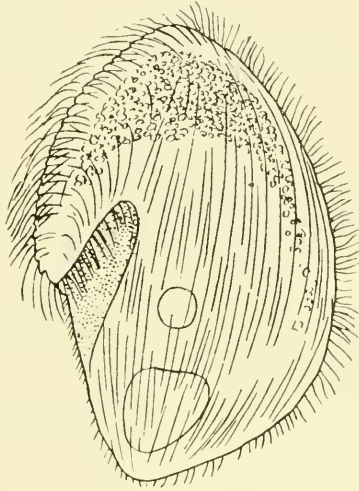


FIG. 3.—*Conchophthirus lamellidens*, sp. nov.

very distinct, specially in the anterior half of the left margin. Macronucleus oval or triangular, posterior and subterminal. C. V. one, subcentral, generally in the middle third of the body-length at its posterior end. Length 0.09 mm.

Conchophthirus curtes, Engelmann.

My specimens differ from the specimens described by Engelmann in the following points: The oval macronucleus is mostly placed with its long axis in the same line as the long axis of the body. C. V. without accessory vesicles. The cytopharynx is not only directed backwards (to the right side) but also curves posteriorly at a little distance behind the macronucleus.

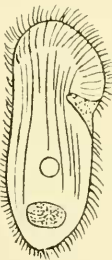


FIG. 4.—*Conchophthirus curtes*, Engelm.

The species of *Conchophthirus* are thus raised to 8 in number. They may be tabulated in the following synopsis:—

- a. Peristome in the anterior body half far removed forward from the middle of the body-length.
 - a¹. Peristome widely cup-shaped, at the anterior end of the left side; a small fascicle of bristles anteriorly; macronuclei 7 in number (moniliform?); C. V. sub-central; body oval, body length = 1½ times the width, length 0.13 to 0.093 mm.

1. *C. steenstrupi*, Stein.

- b¹ Peristome small, near the anterior end; no fascicle of bristles anteriorly; macronucleus single.
- a². Peristome ending in a short recurved cytopharynx; macronucleus spherical or oval, subcentral; C. V. posterior; body elongately oval, length = twice the breadth, length 0.07 mm.—0.110 mm.
2. *C. antedonis*, Andre.
- b². Peristome small and conical, at about the junction of the anterior and middle thirds of the body length; macronucleus oval, posterior; C. V. at about the junction of the middle and posterior thirds of the body length; body elongated, length = 2½ times the breadth; length 0.05 mm.
3. *C. elongatus*, sp. n.
- b. Peristome in or near the middle of the left side.
- a¹. Peristome ending in a long recurved cytopharynx passing to the right side.
- a². Surface of the body smooth.
- a³. Body elongately oval, rounded at both ends; length = twice the breadth; macronucleus spherical and posterior; C. V. subcentral.
4. *C. anodontae*, Ehrbg.
- b³. Body broadly oval or rounded with dorsal surface strongly convex and ventral surface flattened; macronucleus oval, subcentral; C. V. one, near the macronucleus, with or without accessory vesicles.
5. *C. curtes*, Engelm.
- b². Surface of body with longitudinal ridges in its middle two-thirds; body ovate, narrow anteriorly; macronucleus reniform; C. V. posterior and subterminal.
6. *C. metschnikoffi*, Certes.
- b¹. Peristome not ending in a long recurved cytopharynx.
- a². No adhesive disc; body oval with a notch in the posterior half of the left margin; body length = 1½ times the width; body length 0.09 mm.; peristome tubular; macronucleus oval and posterior; C. V. in posterior body-half.
7. *C. lamellidens*, sp. n.
- b². An adhesive disc occupying ¾rds of the ventral surface; peristome oval, behind the middle of the left side; body oval, rounded at both ends; right side convex; ventral surface flat and dorsal surface convex; C. V. in posterior body-half; macronucleus spherical or ovoid. Length 0.092—0.127 mm.
8. *C. discophorus*, Mermod.

LITERATURE.

1. ANDRE.—*Rev. Suisse. Zool.*, XVIII, p. 179, 1910.
2. BÜTSCHLI.—Protozoa, Bronn's *Thier-reich*, p. 1720.
3. CAULLERY AND MESNIL.—*C. R. Soc. biol., Paris*, LV, 1903, pp. 806-809.
4. CERTES.—*Mem. Soc. Zool., France*, IV, 1891, p. 6, pl. i.
5. CLAPAREDE.—*Beobachtungen über Anat. und Entwicklungsgesch. wirbelloser Tiere* (Leipzig, 1861), p. 2.
6. GOURRET AND ROESER.—*Arch. Zool. Experim.*, 1886, IV, pp. 443-534.
7. GRUBER.—*Zeitschr. f. wissenschaft. Zool.*, XXXIII, 1879, p. 454.
8. KENT.—*A Manual of Infusoria*, 1880-1882.
9. MERMOD.—*Rev. Suisse. Zool.*, XXII, pp. 82-90, 1914.
10. SCHUBERG.—*Arbeiten aus den Zool.-Zoot. Institute in Würzburg*, 1889, IX, p. 83.